Heterogeneous transceivers and supportive relay: assessment of energy efficiency improvement

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Abstract:

This TD presents a comparison of energy consumption of two-hop transmission via supportive relay vs. the direct link, between the same source and destination. In particular, it considers a general case, when the transceivers at source, relay and destination all differ. We say that the transceivers are heterogeneous. A model of total transceiver power consumption as a function of transmit power is provided for convenience. Assuming adaptive transmission power control with perfect knowledge of channel loss, the total transceiver power consumption becomes a function of the channel loss. We derive the ratio between two-hop and single-hop energy consumption as a function of channel loss along each of the three links, parametrized by the transceiver characteristics. The equipotential planes of this ratio are compared with the operating region of the transceivers, in the space of channel losses. We show how the transceiver parameters influence energy efficiency of two-hop supportive relay, relative to the direct link, and apply the analysis to the cellular scenario with one relay between the base station and a user terminal. It turns out that energy savings are possible when supportive relay is used.